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PLANETARY PHENOMENA FOR NOVEMBER AND  
DECEMBER, 1922

MALCOLM McNEILL

## PHASES OF THE MOON, PACIFIC TIME

Full Moon,	Nov. 4, 10 <sup>h</sup> 36 <sup>m</sup> A.M.	Full Moon,	Dec. 4, 3 <sup>h</sup> 24 <sup>m</sup> A.M.
Last Quarter,	" 11, 11 52 P.M.	Last Quarter,	" 11, 8 41 A.M.
New Moon,	" 18, 4 6 P.M.	New Moon,	" 18, 4 20 A.M.
First Quarter,	" 25, 12 15 A.M.	First Quarter,	25, 9 53 P.M.

The Sun passes the winter solstice and winter begins Dec. 22, 6<sup>h</sup> 57<sup>m</sup> A. M., Pacific Time.

*Mercury* is a morning star on Nov. 1 having passed greatest west elongation on Oct. 30. It rises about an hour and a half before sunrise. It is therefore in good position for early morning observation on that date. The gap between Sun and planet gradually closes up and superior conjunction is reached on Dec. 6, the planet now becoming an evening star. By the end of the month *Mercury* is well out toward greatest east elongation setting about an hour after sunset. It is in conjunction with *Jupiter* on Nov. 10 and with *Venus* on Nov. 27.

*Venus* is still an evening star on Nov. 1, setting a little more than an hour after sunset; the two bodies are approaching each other and inferior conjunction is reached on Nov. 24. The very great brightness of *Venus* will allow naked eye view until well on toward the date of conjunction. At conjunction the planet will pass about 3° south of the Sun. The planet now becomes a morning star and will come into view a few days later in the morning twilight. Its line of motion among the stars now brings it into a position much north of the Sun, so that the interval between the rising of the planet and that of the Sun increases very rapidly. By the middle of December it rises more than two hours before sunrise and at the end of the month the interval is well over three hours. This is markedly larger than the interval between the setting of the Sun and that of the planet during the past summer when the planet was an evening star. On Dec. 30 the planet again reaches its greatest brilliancy and can be easily seen in full sunlight if the observer looks in the right place for it.

*Mars* remains an evening star with the distance from Sun to planet gradually diminishing from  $89^\circ$  on Nov. 1 to  $66^\circ$  on Dec. 31, but with a great northward motion relative to the Sun so that while it is  $7^\circ$  south of the Sun on Nov. 1 it is  $16^\circ$  north of that body on Dec. 31. In determining the setting time for the planet this nearly counterbalances the effect of the diminution of easterly distance from the Sun, so that the setting time of the planet remains nearly constant, changing only from  $10^h16^m$  p. m. on Nov. 1 to  $10^h6^m$  on Dec. 31. Its distance in miles from the Earth increases from 102 millions on Nov. 1 to 140 on Dec. 31, and in consequence of this its brightness diminishes about one magnitude during the period, being on Dec. 1 reduced to that of an average first magnitude star. During the two months the planet moves  $42^\circ$  eastward and  $15^\circ$  northward through *Capricorn* into *Aquarius*. It will be in very close conjunction with *Uranus* on the early morning of Dec. 25, Christmas.

*Jupiter* became a morning star on Oct. 23 but does not reach a sufficient distance from the Sun for early morning view until toward the middle of November. By the end of December it rises at about 3 A. M. It moves about  $11^\circ$  eastward and  $4^\circ$  southward in the eastern part of *Virgo*.

*Saturn* became a morning star on Oct. 4 and on Nov. 1 rises about two hours before sunrise; by the end of December it rises before 1 A. M. It moves about  $5^\circ$  eastward during the two months in *Virgo* and at the end of December it is less than  $2^\circ$  west and  $5^\circ$  north of *Spica*, the brightest star of the constellation. The planet will be a trifle brighter than the star. As seen in the telescope the minor axis of the rings will be about one-fifth of the major, a fraction nearly double what it was in March.

*Uranus* is in fine position for evening observation during November and December, not setting until nearly 2 A. M. on Nov. 1, and until nearly 10 P. M. on Dec. 31. However, as it is only sixth magnitude it can not be easily seen when it is within two hours of setting. It moves a little westward,  $8'$ , until Nov. 19 and then moves eastward about  $40'$  up to Dec. 31. Fortunately it can be easily identified by the 3.8 magnitude star  $\lambda$  *Aquarii*. It was in conjunction with the same star early in October while

the planet was retrograding, and there will be another conjunction now that the planet is again moving eastward. The date of conjunction will be Dec. 23, and the planet will pass about 25' south of the star. This is a little less than the apparent diameter of the Sun or Moon. During the whole of the two months period the star and planet will never be much more than half a degree apart. *Uranus* will also be in very close conjunction with *Mars* at 1 A. M., Dec. 25, Pacific Time. At this time *Mars* will pass only 7' south of *Uranus*, on the other side of  $\lambda$  *Aquarii*. The planets will have set for all points in the United States before the time of nearest approach, but as *Mars* is moving only about 40' daily eastward, the planets will be seen very close together from all parts of the United States on the evening of Dec. 24, Christmas Eve.

*Neptune* rises shortly before midnight on Nov. 1 and at a little before 8 P. M. on Dec. 31. It moves slowly eastward until Nov. 21 and then moves westward on the borderline between *Cancer* and *Leo*.